THE MICROSCOPIC MURDERERS

Drawing by Edward L. Chase

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ANTISEPSIS

Third of the Three Big A's in Surgery

THEY have erected a beautiful monument in Vienna to Semmelweiss, the obstetrician, placing him upon the pedestal they denied him in life. At his feet, looking up into his face with gratitude and reverence, crouches a woman with a child in her arms. Thus have the Viennese reunited Mark Antony, and proved that the good a man does *may* live after him, and the evil—if the noble Semmelweiss could have harbored evil in his great heart—was interred with his bones.

How this monument came to be there is one of the most fascinating stories that have ever been strung on the golden thread of time; for it has solved the problem that haunted the surgeon, which negatived the results of the best planned and most skilfully executed operation, and dispersed the black shadows hovering over what should have been a magnificently successful achievement.

As the third of the "Three Big A's" concerns the most important thing in the world, the preservation of the species, the saving of the mother to her child, it is well worth our attention. They tell the story in this wise:

DEATH walked through the wards of Vienna's magnificent Lying-in Hospital. He passed between the rows of white cots, and laid his grisly hand upon mother after mother, and they followed him into the Great Out-World, leaving their babies behind to the untender mercies of strange women. The students of the first clinic had just come from the anatomical lesson. Washing their hands perfunctorily, they followed the instructor into the wards, examining with scientifically trained touch those who were delegated to the [illegible] nature's holiest purpose.

A few days afterward cold chills seized these women, they burned with fever, their faces sunken, anxious, the embodiment of lingering pain. All through the long night they muttered in delirium, during the day clutching blindly at hopes which plunged drunkenly into the abyss of despair.

A week later, one after the other, they joined the Great Caravan, bereaved victims of the microscopic murderers.

The young Herr Professor, Ignatz Philipp Semmelweiss, dismissed his classes; but he could not dismiss from his mind the pitiful tragedies, the somber note, that throbbed through his sympathetic, kindly heart. "What is this grim terror? Why do these women die? What is this insidious poison that fastens itself upon strong, healthy mothers and rushes them into a quick grave?" He racked his brain for a solution, he read everything written on the subject; but the answer was hidden behind a mocking grimace of a death's head.

Then his good friend Professor Kolletschka, when performing a postmortem, was accidentally pricked on the finger by the knife of a pupil. Through the tiny wound the poison entered, and the inflammation ran riot in the professor's body,—inflammation identical in character with the fever that burned its way through the devoted women back in his hospital wards. In three days Kolletschka was dead!

But the cause of puerperal fever was discovered! It was a septic infection, a form of pyemia! Semmelweiss and his pupils, fresh from the anatomical clinics, and obstetricians everywhere, were infecting mothers with disease, the germs of which adhered to their hands and their clothing!

Then and there the doctor issued a new rule. Students, before touching a patient, were to disinfect their hands with a solution of chlorid of lime.

After that Death passed by on the other side. He had been driven away by a lump of lime, and the science of antisepsis, the "Destruction of the Microscopic Murderers," had its beginning.

Professor Osler is reported to have said that when Harvey promulgated his demonstration of the circulation of the blood not one medical man in England over forty years old would accept it. So with Semmelweiss' discovery. A number of the younger men and some few of the older progressives favored his ideas and adopted his practice; but the great majority would have none of it. Instead, opposition of the most vitriolic nature, even extending to bitterest persecution, was Semmelweiss' portion. He could not move the mountain of medical prejudice that obstructed his path.

Less fitted to brook opposition, because of his highly sensitive nature, than the doughty Scot Simpson, that apotheosis of a fighting man, Semmelweiss' disappointment reacted upon himself. He was finally removed to a lunatic asylum, where he died a few days later as the result of an untreated wound sustained during his last operation, and neglected by the distracted man.

Such tardy recognition has been his heritage, and so much enthusiasm has the wonderful work of Pasteur and Lister evoked, that even profound scholars, as Dunglison and Roswell Park, in their histories of medicine, never even mention Semmelweiss or his work. Josh Billings was right, "The best time to set a hen is when the hen iz reddy." The best time to inculcate a new idea is when humanity "iz reddy" to accept it. Excepting the intrepid Simpson, and a corporal's guard of innovators, Semmelweiss' great dis overy languished in obscurity, unheeded and ignored by the great mass of obstetricians and surgeons, and year after year mothers, with streaming eyes, saw their babies taken from the cradle of their arms, and felt the onset of that grim battle which left them white and stark.

It was almost three decads before the genius of Pasteur forced the world to accept the fact that decomposition was caused by living germs, and that these minute forms of vegetable and animal life were the potential murderers of the humanity they infected.

WHEN Lister was house surgeon at University Hospital, London, about 1870, he observed certain cases of gangrene, a rotting of the tissues, with general septic infection, following operation. He suspected the parasitic nature of the condition from the fact that a simple fracture where the skin was unbroken made good recovery, while a fracture that exposed the tissues to the air would suppurate.

About this time he became interested in preventing decomposition of sewage by treating it with carbolic acid. The process was similar to decomposition in organic tissues. Why might not the use of carbolic acid upon wounded surfaces be attended with results as gratifying as those which followed its use with sewage? He began to wipe the wounds with pure carbolic. The results gave greater satisfaction than any method previously employed,—a wonderful improvement, a splendid achievement, but much still to be desired.

Lister was a thorough workman, a genius with an infinite capacity for taking pains. He started to make his technic more complete. He set himself to find out why some of his cases did badly, notwithstanding their daily painting with acid; and finally decided that the infection must come from ligatures used in tying off the blood vessels and closing the wound.

He steeped some catgut (which, by the way, comes from the intestines of a sheep, and never saw a cat) in carbolic acid. Then he ligated the carotid artery in the neck of a calf with this gut, and turned Bossy loose for a month's observation. At the expiration of this time the calf was killed. On examination it was found that not only had there been no trace of suppuration, but the catgut was completely absorbed, and only a thin fibrous band of tissue remained to show where it had originally been tied. And now catgut ligature is furnished in hermetically sealed tubes, immersed in sterile solution.

Later experience demonstrated that antiseptics (from *anti*, "against," and *septicus*, "putrefaction") were more or less toxic or irritating to the tissues; so this method has been replaced in surgical practice by the aseptic method, which aims to *prevent* sepsis.

The science of bacteriology dates practically from Lister, and now every medical man of any attainments can call most of the bacteria and germs by their first names, and is on speaking terms with all or nearly all of their families.

Even the mamas of the civilized world, when little Johnny or Margaret "barks the skin off" their knee, or cuts a finger, hurries for the H_2O_2, because they aren't taking any chances with infection of any sort.

Inasmuch as every uncooked thing we eat and drink, the air we breathe, and everything we touch is loaded with bacteria,—even our harmless, necessary milk swarms with them,—the question naturally arises, "Why do not bacteria kill us all?"

A FEW decads ago Iliya Metchnikof—then of St. Petersburg, now of Paris—pointed out that certain white corpuscles of the blood, which he named "phagocytes" (from *phagein*, "to eat," and *cytos*, a "cell"), were the natural scavengers of the blood. They constitute themselves a sort of police force, militia, and standing army combined; and when any germs enter the body immediately these valiant defenders pounce upon them.

They proceed to wrap themselves round the bacteria, much as one would turn a rubber cot inside out over the finger; they then pour out a poison that kills the germs, after which they digest them at their leisure. When they have reached the stage of *quantum sufficit*, they unwrap themselves from the remnants of the dinner, and repeat.

This is good for the host and the phagocyte, but bad for the bacteria. Sometimes, however, the legions of phagocytes, or white leucocytes as some call them, are reduced in number, or germs that are numerous and powerful enough to destroy them gain entrance. Then the victim who furnishes the battleground for these microscopic terrors becomes really ill. When this occurs, he is in for a siege of something. Unless the disease can be aborted, as in eruptive diseases, by saturating the patient with calcium sulphid until he smells like a very bad egg, or by giving intestinal antiseptics, and thereby killing off the bacilli, as in typhoid, he must wait until the disease has run its course.

The reason that disease "runs its course," or is "self-limited," is that at the expiration of a certain time—five to seven days in pneumonia, fourteen to seventeen in typhoid, seventeen to twenty-one in smallpox, etc.—the swarming armies of germs have thrown such an amount of excreta into the circulation that this poison, reinforced by the toxin developed from the decomposition of billions of dead bodies of their comrades, kills them off—unless they first kill the patient. This shows that dead germs may be extremely useful. In fact, the deader they are, the more useful they may be in murdering their sisters, cousins, and aunts.

This is the principle of vaccine therapy. A few billion parasites are developed in a "culture." Then they are killed by heating, and, together with their "end products," filtered off, and inserted into the patient. This is most discouraging to the army of invasion, and is probably the most scientific known method of terminating their existence.

Another means of defense against the infinitely little foes of humanity is the development by the cells themselves of a poison inimical to the welfare of the bacillus. This is antitoxin—and a marvelous agent it is too.

The phagocyte frequently becomes satiated from overfeeding, or apathetic and unemotional from discouragement. Then he requires a serum stimulant.

The germs that he should be actively destroying are [illegible]